

RS-002, "PROCESSING APPLICATIONS FOR EARLY SITE PERMITS"

ATTACHMENT 2

2.4.9 CHANNEL DIVERSIONS

REVIEW RESPONSIBILITIES

Primary - Mechanical and Civil Engineering Branch (EMEB)

Secondary - None

I. AREAS OF REVIEW

In this section of the applicant's site safety assessment for an early site permit (ESP) application, the geohydrologic design basis is developed to ensure that a nuclear power plant or plants of specified type (or falling within a plant parameter envelope [PPE]) that might be constructed on the proposed site and essential water supplies will not be adversely affected by natural stream channel diversion or that, in such an event, alternate water supplies would be available to safety-related equipment.

The review includes:

1. Historical channel diversions, including cutoffs and subsidence.
2. Regional topographic evidence which suggests that future channel diversion may or may not occur (used in conjunction with evidence of historical diversions).
3. Alternate water sources and operating procedures (coordinate review with that of safety assessment Section 2.4.11.6).

II. ACCEPTANCE CRITERIA

Acceptance criteria for this section of this review standard relate to the following regulations:

1. General Design Criterion 44 (GDC 44) (Ref. 1) requires an ultimate heat sink capable of accepting the heat load of a nuclear power plant or plants that might be constructed on the proposed site under normal operating and accident conditions.
2. 10 CFR Parts 52 and 100 (Refs. 2 and 3) require that hydrological characteristics be considered in the evaluation of the site.

The regulations at 10 CFR 52.17(a) and 10 CFR 100.20(c) require that physical characteristics of the site, including seismology, meteorology, geology, and hydrology, be taken into account to determine the acceptability of a site for a nuclear reactor.

Channel diversion or realignment, which poses the potential for flooding or adversely affecting the supply of cooling water for a nuclear power plant or plants of specified type (or falling within a PPE) that might be constructed on the proposed site, is one of the many natural phenomena

specified in GDC 2 that must be considered in designing the plant to accommodate the characteristics of a proposed site. Meeting these requirements provides reasonable assurance that the effects of flooding or loss of cooling water caused by channel diversion resulting from severe natural phenomena would pose no undue risk to the type of facility proposed for the site.

For those cases where a reactor design is not specified, the ESP applicant may instead provide a PPE to characterize a facility or facilities for comparison with the hydrologic characteristics of the site. A PPE can be developed for a single type of facility or a group of candidate facilities by selecting limiting values of parameters. Important PPE parameters for safety assessment Section 2.4 include but are not limited to precipitation (e.g., maximum design rainfall rate and snow load) and the allowable site water level (e.g., maximum allowable flood or tsunami surge level and maximum allowable ground water level).

Note: Though not required at the ESP stage, the applicant for a combined license (COL) will need to demonstrate compliance with General Design Criterion 2 (Ref. 4) as it relates to structures, systems, and components important to safety being designed to withstand floods.

To meet the requirements of GDC 44 and 10 CFR Parts 52 and 100 as they relate to channel diversion, the following specific criteria are used:

1. A description of the applicability (potential adverse effects) of stream channel diversions is necessary.
2. Historical diversions and realignments should be discussed.
3. The topography and geology of the basin and its applicability to natural stream channel diversions should be addressed.
4. If applicable, the safety consequences of diversion and the potential for high or low water levels caused by upstream or downstream diversion adversely to affect safety-related facilities, water supply, or ultimate heat sink should be addressed. (Ref. 5) Regulatory Guide 1.27 (Ref. 6) provides guidance on acceptable criteria for ultimate heat sinks.

III. REVIEW PROCEDURES

Site-specific publications and maps are reviewed to identify historical channel diversions and to evaluate (by independent conservative calculations and professional judgment) the potential for future diversions. Where an alternate safety-related cooling water supply is provided, the criteria for safety assessment Section 2.4.11.6 apply and are checked for consistency.

The above reviews are performed only when applicable to the site or site region. Some items of review may be done on a generic basis.

IV. EVALUATION FINDINGS

For ESP reviews and when applicable, findings will consist of a brief general description of historical channel diversions. If the staff concurs with the applicant that channel diversion is unlikely or that a plant or plants of specified type (or falling within a PPE) that might be constructed on the proposed site would be protected from potential flood effects and that alternate essential water supplies meet the criteria of Regulatory Guide 1.27, the findings will so

indicate. If the staff evaluation does not support the applicant's contention of channel stability or the effects of channel diversions, flood protection and/or an alternate source of water may be necessary.

A sample ESP statement follows:

As set forth above, diversions of the A River are well documented in historical and topographic data. Oxbow lakes, low-lying swamps, and bars and chutes provide eloquent evidence of historical diversion. Other organizations are planning further bank protection measures, in addition to the existing levee system, in the vicinity of the planned or likely location of the plant intake structure. However, the diversion of the main channel by degradation/aggradation within the confines of the levee system, or by breaching the west levee during major floods, cannot be discounted. Nonetheless, the ultimate heat sink (as discussed in safety assessment Section 2.4.11) would not be directly dependent on the river intake. Therefore, the staff concludes that the ultimate heat sink of a nuclear power plant of the type specified by the applicant [or of a facility falling within the plant parameter envelope (PPE) submitted by the applicant] that might be constructed on the proposed site would not be endangered by potential channel diversions and thus meets this aspect of GDC 44.

In addition, a nuclear power plant of type specified by the applicant [or falling within the PPE submitted by the applicant] that might be constructed on the proposed site would be well away from the path of any potential diversion of the A River and well above the level of any resultant flood. Therefore, the staff concludes that the proposed site meets the requirements of 10 CFR Parts 52 and 100 with respect to floods caused by channel diversions.

Based upon the above evaluation, the staff concludes that channel diversions present no safety-related hazard to a nuclear power plant of type specified by the applicant [or to a facility falling within the PPE submitted by the applicant] that might be constructed on the proposed site and that the requirements of 10 CFR Parts 52 and 100 relative to channel diversions have been met.

V. IMPLEMENTATION

The following is intended to provide guidance to applicants and licensees regarding the NRC staff's plans for using this section of this review standard.

This section will be used by the staff when performing safety evaluations of ESP applications submitted by applicants pursuant to 10 CFR Part 52. Except in those cases in which the applicant proposes an acceptable alternative method for complying with specified portions of the Commission's regulations, the method described herein will be used by the staff in its evaluation of conformance with Commission regulations.

Implementation schedules for conformance to parts of the method discussed herein are contained in the referenced regulatory guides.

VI. REFERENCES

No specific publications can be cited for general use. However, site-specific publications and maps can be obtained from the United States Geologic Survey, Soil Conservation Service, National Oceanic and Atmospheric Administration, Corps of Engineers, and State and other agencies and organizations, to identify historical and potential future channel diversions.

1. 10 CFR Part 50, Appendix A, General Design Criterion 44, "Cooling Water."
2. 10 CFR Part 52, "Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants."
3. 10 CFR Part 100, "Reactor Site Criteria."
4. 10 CFR Part 50, Appendix A, General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena."
5. Regulatory Guide 1.70, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants."
6. Regulatory Guide 1.27, "Ultimate Heat Sink for Nuclear Power Plants."